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Inventors: Robert P. Fabinski, Laurence J. Lobel
Customer No. 01333

ELECTRONIC SERIALIZATION OF IMAGE SENSORS

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P.O. Box 1450
Alexandria, VA. 22313-1450

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ELECTRONIC SERIALIZATION OF IMAGE SENSORS

FIELD OF THE INVENTION

The invention relates generally to the field of image sensors and, more particularly, to such image sensors having an embedded signal therein for identifying the particular manufacturer, die location and the like.

BACKGROUND OF THE INVENTION

As is well known in the art, image sensors include a plurality of pixels for capturing an electronic representation of an image. Typically, a plurality of sensors is manufactured on one wafer, and the wafer is then cut so that each sensor has its own individual silicon substrate.

During manufacturing, it is desirable to know the spatial location of the wafer of one sensor in relation to the original uncut wafer since performance can be affected by location. In this regard, manufacturers typically test the sensors after the cutting process and knowing the precise location assists test personnel in calibration, future manufacturing, and the like. Obviously, manual tagging is labor intensive, prone to error due to misplaced and lost tags and the like.

Consequently, a need exists for having a sensor in which the sensor location in relation to the original uncut wafer is embedded in the sensor for efficient testing and manufacturing.

SUMMARY OF THE INVENTION

The present invention is directed to overcoming one or more of the problems set forth above. Briefly summarized, according to one aspect of the present invention, the invention resides in an image sensor comprising a substrate having a plurality of photosensitive sites for capturing an image and a plurality of additional photosensitive sites; and a digital signal embedded in one or more of the additional photosensitive sites for the purpose of identifying individually or in any combination particular manufacturer, lot, wafer, and/or position on the wafer during manufacture of the image sensor.

These and other aspects, objects, features and advantages of the present invention will be more clearly understood and appreciated from a review of the following detailed description of the preferred embodiments and appended claims, and by reference to the accompanying drawings.

Advantageous Effect Of The Invention

The present invention has the advantage of having an embedded signal in the sensor that identifies lot location and the like.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a top view of an image sensor of the present invention;

Fig. 2 is a side view of the sensor having a plate with apertures therein for embedding a signal therein;

Fig. 3 is a top view of Fig. 2;

Fig. 4 is an alternative embodiment of Fig. 3;

Fig. 5 is a graph illustrating signal coding of the alternative embodiment; and

Fig. 6 is a perspective view of a digital camera.

DETAILED DESCRIPTION OF THE INVENTION

Referring to Fig. 1, there is shown the image sensor 10 of the present invention. The sensor 10 includes a substrate 20 in which a plurality of pixels 30 is disposed within a predetermined portion of the substrate 20. This is commonly referred to as the active area. As is well known in the art, the pixels 30 capture incident light that is converted into a charge packet for forming an electronic representation of the image. The substrate 20 includes a non-active area 40 surrounding the active area in which an identification code is embedded, as will be described in detail hereinbelow.

It is instructive to note at this point that the manufacture of the active area will not be described in detail herein since it can be done by any well-known method and apparatus. Now referring to Figs. 2 and 3, during manufacture of the original wafer, a metal plate 50 having one or more apertures or openings

60 at predetermined locations is placed covering all or a portion of the non-active portion of the wafer. The particular locations of the apertures 60 are varied from sensor to sensor so that the unique pattern eventually embedded in the sensor corresponding to the one or more aperture locations is unique to that particular sensor.

The substrate 20 is then exposed to light for embedding a signal in the non-active area 40. As illustrated in the graph of Fig. 2, this induces a predetermined voltage at each location that is exposed to light so that an "on state" is produced at the exposed locations and an "off state" is produced at all other locations in the non-active area. As stated above, this unique code or combination of "on" and "off" states can identify the particular wafer location of the sensor, manufacturer, lot, and/or wafer. It is noted that the embedded signal does not affect the active area so that the integrity of the image capture process is preserved.

Referring to Fig. 4, there is shown an alternative embodiment of coding an image sensor. In this case, the entire non-active area is exposed to light or "on" as illustrated in Fig. 5. In this embodiment, a portion of the buried channel 70 is removed in the non-active area 40. This permits charge from area above the removed buried channel to be dumped into the lateral overflow drain 80. This effectively creates a partially dead column. The start position of the dead column uniquely identifies the embedded information.

Referring to Fig. 6, there is shown a digital camera 90 for implementing the sensor of the present invention into a commercial embodiment to which an ordinary consumer is accustomed.

The invention has been described with reference to a preferred embodiment. However, it will be appreciated that variations and modifications can be effected by a person of ordinary skill in the art without departing from the scope of the invention.

PARTS LIST

10	image sensor
20	substrate
30	pixels/active area
40	non-active area
50	metal plate
60	apertures or openings
70	buried channel
80	lateral overflow drain
90	digital camera